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General article

Why is the lawn buzzing?

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Abstract

Graminoids, including grasses, are frequently described in the botanical literature as being wind-pollinated. This paper offers visual evidence for insect pollination of a grass. Three of the bees involved were found to have 100% grass pollen in their pollen sacs. In reviewing the literature for this paper, it was evident that those working with bees are well aware that these insects often pollinate graminoids. It is not clear why this information has not been incorporated into the botanical literature.

Keywords

Honey bees, *Apis mellifera*, centipede grass, turf grass, *Eremochloa ophiuroides*, pollination, *Poaceae*, anemophilous, entomophilous

Introduction

Two taxa interacting half a world away

Centipede grass (*E. ophiuroides*) (Figs 5, 7) is a turf grass that originated in Asia, that is now found world-wide (Thieret 2003). The popularity of centipede grass is no doubt the result of its small leaves, prostrate growth habit, and ground-hugging mats of long stolons. When blooming, this low-growing grass will produce an inconspicuous inflorescence that is hard to see from a distance. This minimal amount of maintenance and visibility, has

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inspired another common name, lazy man's grass, as it requires only an occasional mow to keep in check.

Apis mellifera, or honey bees, were introduced to North America by European settlers in the 1700's and are not native to the North American continent. They are now best described as being ubiquitous worldwide. Agricultural necessity has fostered this expansion as bees help to pollinate crops. Their evolutionary and phylogenetic origins appear to be multiple radiations out of Africa, with later expansions to Asia and Europe (Whitfield et al. 2006).

Material and methods

Observations were made by sitting/walking in a residential lawn in Baton Rouge, Louisiana, USA, during late September 2013 through early October 2013 (Fig. 1). Occurrences of honey bees visiting centipede grass were documented with both video and still imagery. All observations were between 10:00 AM and 2:00 PM, consisting of video, and one session of macro-photography (Fig. 2). The grass was sampled for identification and a specimen sheet was created at Louisiana State University Herbarium (Fig. 3). Other plants at anthesis that could provide potential forage for bees were also noted. (Table 1).

Table 1.

Other plants at anthesis in association with *E. ophiuroides*.

Species	Family
Duchesneaindica (Andrews) Focke	*Rosaceae*
Mikaniascandens B.L.Rob.	*Asteraceae*
Ligustrumsinense Lour.	*Oleaceae*
Lablabpurpureus (l.) Sweet	*Fabaceae*
Kyllingabrevifolia Rottb.	*Cyperaceae*
Oplismenushirtellus (L.) P. Beauv.	*Poaceae*
Digitariaciliaris (Retz.) Koeler	*Poaceae*
Ruelliasimplex C.Wright	*Acanthaceae*
Brugmansia sp. Pers.	*Solanaceae*

Table 2.

Pollen analysis after acetolysis from bee corbiculae

Bees – using one corbicula	Sampled pollen grains	Percentage *Poaceae* pollen
1	252	100%
2	266	100%
3	270	100%

Figure 1.

Video observations of multiple bees collecting pollen from centipede grass

Figure 2.

Honey bee moving pollen up the culm, while also spreading pollen through biotic winds; here with pollen visible at left and below bee

Figure 3.

Eremochloa ophiuroides specimen collected at observation locality

A total of three bees were sampled for taxonomic identification and examined by curators at the Louisiana State University Arthropod Museum (Fig. 4). One honey bee pollen basket was then sampled for homogeneity at Louisiana State University Center for Excellence in Palynology (Fig. 6). Three honey bee corbiculae pollen contents were then sent to and processed by at Washington State University via acetylosis. Pollen identification was later performed by the Palynology consultants at University of Arizona.

Figure 4.

Collected honey bee with body dusted in pollen and packed pollen baskets or corbiculae

Figure 5.

Centipede grass at anthesis

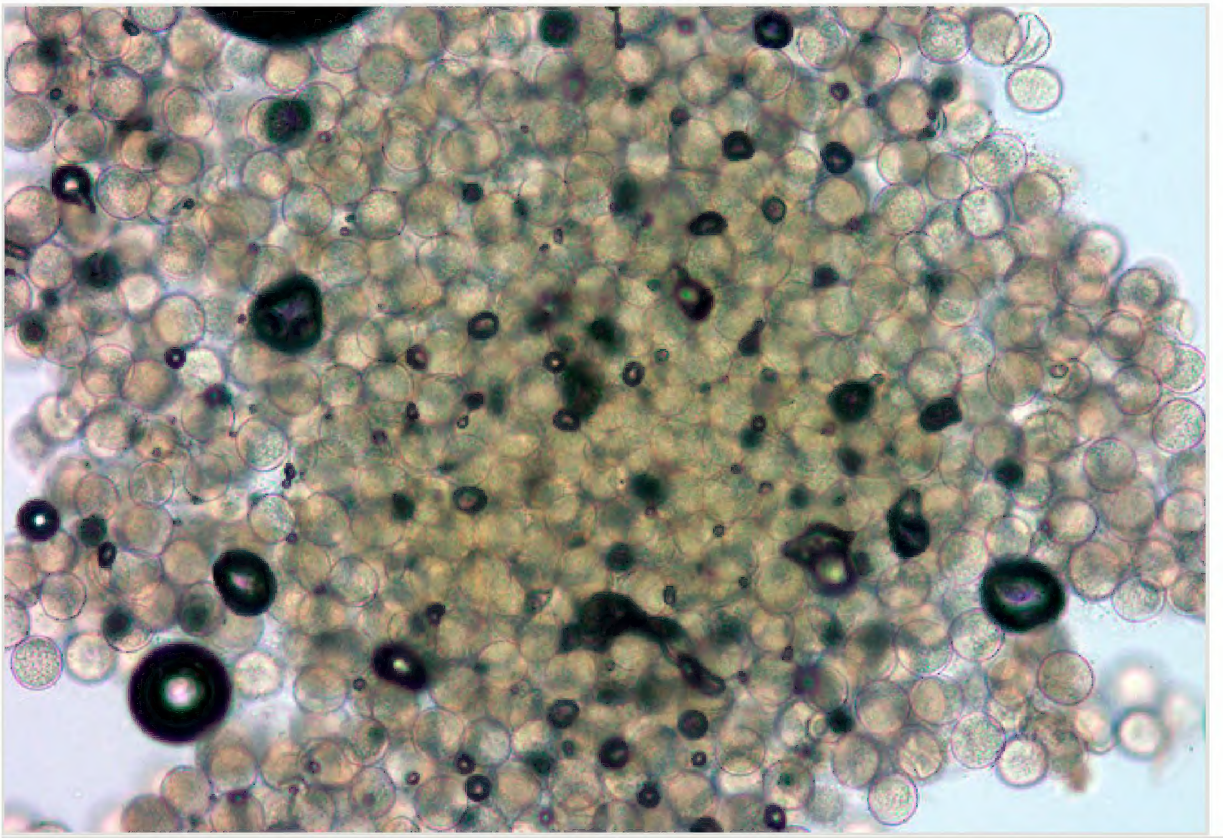

Figure 6.

Pollen sample at 20× from one bee corbicula demonstrating homogeneity. Image by: Sophie Warny

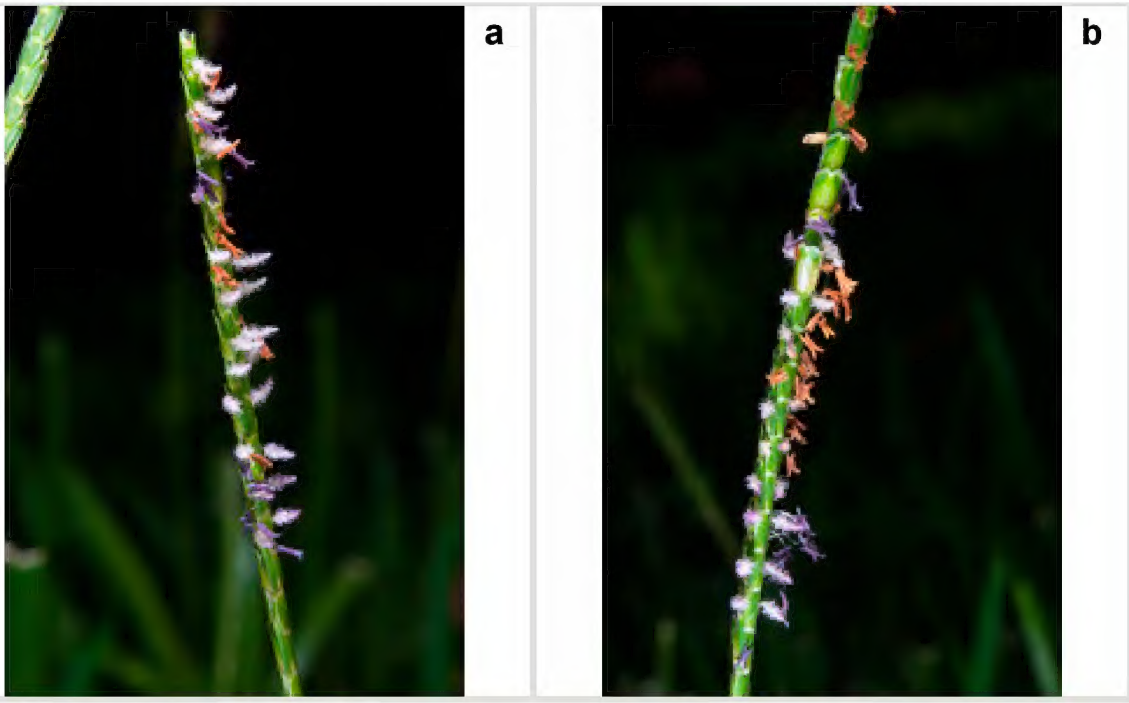

Figure 7.

Inflorescences demonstrating color change in anthers after dehiscence from purple to brown

a: anthers before and after dehiscing
b: another culm showing same anther color changes

Equipment used:

- Galaxy Note I cell phone for video
- Nikon D300 DSLR camera with a 1:1 macro lens for still images
- Olympus Microscope with slaved digital camera for microscopy images

Data resources

Rainfall prior and post-observations; a wet summer/early fall and not a time of drought stress/starvation (Table 3, Suppl. materials 1, 2, 3, 4, 5, 6)

Table 3.

Precipitation amounts for summer and early fall 2013, in Baton Rouge, Louisiana, USA. http://www.ncdc.noaa.gov/

Month (2013)	Precipitation (cm)
June	10.4
July	11.9
August	10.9
September	19.3
October	7.9
Total	**60.4**

Results

The honey bees were exclusively gathering unifloral *Poaceae* pollen (Table 2). Macro-photography revealed that as the bees traveled from inflorescence to inflorescence, they generated biotic winds that moved the *Poaceae* pollen significant distances (Fig. 8).

Figure 8.

"Pollen biotic winds" caused by honey bees are denoted by arrows showing dispersal of grains between culms – original images available at http://www.herbarium.lsu.edu/keys/pensoft/bees3/

a: Pollen dispersal caused by bee
b: Spreading of pollen as result of bee
c: Pollen both above and below bee
d: Distribution and distance of pollen travel from bee

Discussion

The graminoids are treated in botanical literature as using the pollination syndrome of anemophily (Niklas 1985), or abiotic wind pollination (c.e.g., Walters and Keil 1996). A reason for this abiotic relationship are that the flowers are small and drab in appearance rather than showy (Knuth 1909). In contrast, though diminutive and lacking petals and

sepals, most graminoid inflorescences are quite colorful when blooming, plus present ultraviolet visual cues that are visible to the bees but cannot be seen by humans (Baby et al. 2013). This dichotomy reveals an interesting question: is this just a scale problem for attractiveness? Insects are resourceful feeders, and will take advantage of pollen feeding opportunities that are acceptable and provide visual signatures of readiness for anther dehiscence (Fig. 7).

Honey, a well documented economic commodity that is studied and sampled for purity and origins, tells a different story from botanical literature. Melissopalynology, or the study of pollen in honey, describes the collection of graminoid pollen by honey bees as commonplace. This literature is not isolated but found from across the globe, describing collection of pollen from all graminoids: *Poaceae* (Keller et al. 2005), *Cyperaceae* (Song et al. 2012), and *Juncaceae* (Huang et al. 2013). Interestingly, additional observations of other non-graminoid anemophilous plants of the *Angiospermae*, are also found to have associations with honey bees; including willows (*Salicaceae*) (Puusepp and Koff 2014, Salonen et al. 2009), oaks (*Fagaceae*) (Stawiarz and Wroblewska 2010, Bryant 2001), and even glassworts (*Sarcocornia*) (Adam et al. 1987).

Acknowledgements

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Author contributions

Tim Jones observed the process and collected all samples. Dr. Victoria Bayless identified the honey bees as honey bees. The fly was identified by Tim Jones using the LSU Entomology collection. Dr. John G. Jones identified the pollen samples collected from the bees. Dr. Sophie Warny and Dr. Vaughn Bryant provided in-person and email palynological advice, respectively.

References

- Adam P, Fisher A, Anderson JME (1987) Pollen collection by honey bees from *Sarcocornia quinqueflora*. Wetlands 7: 25-28. [In English]. URL: http://ojs.library.unsw.edu.au/index.php/wetlands/article/viewFile/147/159
- Baby S, Johnson AJ, Govindan B, Lukose S, Gopakumar B, Koshy KC (2013) UV induced visual cues in grasses. Scientific Reports 3: 1-6. DOI: 10.1038/srep02738
- Bryant VM (2001) The r-values of honey: pollen coefficients. Palynology 25 (1): 11-28. DOI: 10.2113/0250011

- Huang S, Xiong Y, Barrett SH (2013) Experimental Evidence of Insect Pollination in Juncaceae, a Primarily Wind-Pollinated Family. International Journal of Plant Sciences 174 (9): 1219-1228. DOI: 10.1086/673247
- Keller I, Fluri P, Imdorf A (2005) Pollen nutrition and colony development in honey bees: part I. Bee World 86 (1): 3. [In English]. URL: http://www.db-alp.admin.ch/de/publikationen/docs/pub_Kellerl_2005_17250.pdf
- Knuth P (1909) Handbook of Flower Pollination based upon Hermann Müller's work “The Fertilisation of Flowers by Insects”. 3. Clarendon Press at Oxford, 1 pp.
- Niklas K (1985) The aerodynamics of wind pollination. The Botanical Review 51 (3): 328-386. DOI: 10.1007/bf02861079
- Puusepp L, Koff T (2014) Pollen analysis of honey from the Baltic region, Estonia. Grana 53 (1): 54-61. DOI: 10.1080/00173134.2013.850532
- Salonen A, Ollikka T, Grönlund E, Ruottinen L, Julkunen-Tiitto R (2009) Pollen analyses of honey from Finland. Grana 48 (4): 281-289. DOI: 10.1080/00173130903363550
- Song X, Yao Y, Yang W (2012) Pollen Analysis of Natural Honeys from the Central Region of Shanxi, North China. PLoS ONE 7 (11): e49545. DOI: 10.1371/journal.pone.0049545
- Stawiarz E, Wroblewska A (2010) Melissopalynological analysis of multifloral honeys from the Sandomierska area of Poland. Journal of Apicultural Science 54 (1): 65. URL: http://www.jas.org.pl/jas_54_1_2010_8.pdf
- Thieret JW (2003) Eremochloa. In: Barkworth ME, Capels KM, S.Long, Piep MB (Eds) Flora of North America vol. 24. 25. [In English]. URL: http://herbarium.usu.edu/webmanual/ [ISBN 0195167481].
- Walters DR, Keil DJ (1996) Vascular Plant Taxonomy. 4th. Kendall Hunt Pub Co, 608 pp. [In English]. [ISBN 0787221082]
- Whitfield CW, Behura SK, Berlocher SH, Clark AG, Johnston JS, Sheppard WS, Smith DR, Suarez AV, Weaver D, Tsutsui ND (2006) Thrice Out of Africa: Ancient and Recent Expansions of the Honey Bee, *Apis mellifera*. Science 314 (5799): 642-645. DOI: 10.1126/science.1132772

Supplementary materials

Suppl. material 1: Climatological Data for Louisiana, June 2013

Authors: National Oceanic and Atmospheric Administration
Data type: PDF
Brief description: Flat file for June 2013 precipitation
Filename: JUN-IPS-5D28FA81-8527-40F2-A945-ABB8C9E0DFC6.pdf - Download file (119.28 kb)

Suppl. material 2: Climatological Data for Louisiana, July 2013

Authors: National Oceanic and Atmospheric Administration
Data type: PDF

Brief description: Flat file for July 2013 precipitation
Filename: JULY-IPS-21902718-8AA4-48C8-B3D8-9E4A4A187365.pdf - Download file (127.15 kb)

Suppl. material 3: Climatological Data for Louisiana, August 2013

Authors: National Oceanic and Atmospheric Administration
Data type: PDF
Brief description: Flat file for August 2013 precipitation
Filename: AUG-IPS-90810763-83EB-4E6C-BCFC-7FB2E67F2F60.pdf - Download file (117.75 kb)

Suppl. material 4: Climatological Data for Louisiana, September 2013

Authors: National Oceanic and Atmospheric Administration
Data type: PDF
Brief description: Flat file for September 2013 precipitation
Filename: SEPT-IPS-B824F6BC-3673-4918-9A7F-452017F0CC61 (1).pdf - Download file (117.65 kb)

Suppl. material 5: Climatological Data for Louisiana, October 2013

Authors: National Oceanic and Atmospheric Administration
Data type: PDF
Brief description: Flat file for October 2013 precipitation
Filename: OCT-IPS-34C96BBC-703A-4AFD-A963-BE69122AF0C0.pdf - Download file (123.18 kb)

Suppl. material 6: Derived wet summer data from NOAA

Authors: NOAA and Tim Jones
Data type: xls
Brief description: "How-did" converting inches to centimeters across three weather points in Baton Rouge, La., from manual NOAA PDF amalgamation
Filename: weather-3.xlsx - Download file (8.14 kb)